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July 29, 2002

Via Hand Delivery
Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, D.C. 20554

Re: ***Ex Parte* Presentation**
IB Docket No. 01-185, *Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz band*;
File No. SAT-ASG-20010302-00017 et al., *Application of Mobile Satellite Ventures Subsidiary LLC to Launch and Operate a Next-Generation Satellite System*

Dear Ms. Dortch:

Mobile Satellite Ventures Subsidiary LLC ("MSV") hereby files an original and four (4) copies of the attached paper entitled "Further Technical Analysis" for inclusion in the record of the above-captioned proceedings.

Very truly yours,

David S. Konczal

cc: Richard Engelman
Breck Blalock
Trey Hanbury
Paul Locke

No. of Copies rec'd 0+4
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Further Technical Analysis

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1. INTRODUCTION & EXECUTIVE SUMMARY

This Further Technical Analysis is submitted in response to recent filings by Inmarsat Ventures plc and a joint filing by Sprint Corporation and Cingular Wireless LLC. The Inmarsat filings allege that MSV's proposed ancillary terrestrial operations will interfere with Inmarsat's own operations and that MSV's proposal for monitoring interference levels would be ineffective. Sprint and Cingular attach an analysis by Telcordia Technologies that purports to show that it is more spectrum efficient to reallocate MSS spectrum to terrestrial-only use than to permit MSS systems to operate co-frequency ancillary terrestrial networks.

This Further Technical Analysis demonstrates the errors in the Inmarsat and Telcordia analyses. We show that MSV's satellite system operations will continue to be the driver in any frequency coordination with Inmarsat. MSV's ancillary terrestrial traffic will transmit a negligible amount of energy capable of reaching Inmarsat's satellite antennas, both in absolute terms and relative to the energy transmitted by MSV's satellite traffic. We also provide further support for MSV's earlier explanations of its ability to reuse its spectrum for satellite operations and its ability to share spectrum between satellite and terrestrial operations, refuting Inmarsat's contentions to the contrary. When Telcordia's faulty assumptions are corrected, it is apparent that the most efficient way to provide both satellite and terrestrial services in the L-band is to operate an integrated system along the lines of MSV's design. We also show that monitoring of potential interference to Inmarsat can be done effectively by MSV's satellites.

II. The Potential for Sharing Between MSV and Inmarsat

Inmarsat submitted a lengthy *ex parte* technical filing on May 10, 2002 that largely rehashes arguments that it has made previously that MSV's mobile terminals when they operate in the terrestrial mode will interfere with Inmarsat's satellite uplinks.[1] The only new argument Inmarsat makes in its May 10 filing is a claim that MSV has overstated the amount of frequency reuse that MSV's satellite operations will be able to achieve and thereby overstated the extent of the interference that MSV's satellite operations may cause to Inmarsat co-channel operations. (MSV has said that it will achieve 28-fold frequency reuse on its satellite operations; Inmarsat contends that reuse will be no more than 10 fold.) Inmarsat contends that by correcting these errors, it is apparent that, but for MSV's terrestrial operations, it would be possible for Inmarsat and MSV to share substantially more co-channel spectrum.

As an initial matter, if Inmarsat truly wants to increase the potential for co-channel sharing between our two systems, the most appropriate place to start would be for Inmarsat to use a more reasonable estimate for the amount of antenna discrimination that it claims, rather than attempting to analyze the amount of frequency reuse that MSV can expect to achieve. As MSV has shown previously, Inmarsat should be able to achieve at least 25 dB of antenna discrimination on Inmarsat-4 satellites used to provide service outside the United States. The use of the more realistic estimate for the antenna discrimination parameter would permit more sharing between MSV and Inmarsat, and would decrease Inmarsat's vulnerability to interference from any MSV traffic. MSV points out that unless the Inmarsat 4 satellite spot-beams can produce a discrimination of

[1] *See* Letter from John P. Janka, Counsel for Inmarsat, to Ms. Marlene H. Dortch, FCC, IB Docket No. 01-185 (May 10, 2002).

at least 25 dB, even over Inmarsat's own system footprint where co-channel reuse is employed, Inmarsat 4 operations may become interference limited from Inmarsat's own (intra-system) frequency reuse.[2]

In any event, MSV stands behind its stated expectation of achieving at least 28-fold frequency reuse on its satellite operations. MSV reasonably expects its satellite traffic to be uniformly distributed over all spot beams, since any area where there are large spikes in traffic will be served primarily by MSV's terrestrial facilities and by other wireless operators. Thus, an interference analysis based on MSV's maximum satellite frequency reuse is prudent and appropriate for coordination.

Moreover, MSV may increase its satellite frequency reuse even more than 28 fold. MSV may deploy an even larger antenna than proposed in its application and it may evolve from a 7-cell reuse pattern to a 4-cell reuse pattern, which could lead to 50-fold frequency reuse. MSV is also planning its own L-band MSS satellite for coverage of South America. Such a satellite would be designed to provide further co-channel frequency reuse of MSV's North American frequencies, but would further reduce the likelihood of co-channel sharing with Inmarsat.

[2] Assuming 25 dB of satellite spot-beam antenna discrimination and a maximum of only 10-fold frequency reuse that Inmarsat claims can be achieved over the Inmarsat 4 system, the C/I due to Inmarsat's own intra-system operations is 15 dB. Operating with more than 10-fold frequency reuse, as Inmarsat 4 is capable of doing, the C/I becomes even smaller and may significantly impact system performance. If we assume only 20 dB of satellite spot-beam antenna discrimination, as Inmarsat asserts is the case for Inmarsat 4, the C/I drops to 10 dB or lower, rendering the system severely interference limited. The inescapable conclusion is one: Either Inmarsat is investing billions of dollars to deploy an interference limited system that can not achieve the full capacity that it is designed for, or the satellite spot-beam antenna discrimination is of the order of 25 dB or greater.

Finally, regardless of the size of the interference potential to Inmarsat of MSV's satellite uplinks, the absolute size of the interference potential of MSV's terrestrial operations remains negligible. As MSV has calculated it, the potential impact of a fully-loaded ancillary terrestrial network on co-channel Inmarsat operations, even assuming that Inmarsat continues to claim only 20 dB on satellite antenna discrimination, is negligible.

III. Sharing Between MSV's Satellite and Ancillary Terrestrial Operations

This section looks at filings by Inmarsat and Sprint/Cingular that purport to show that sharing between terrestrial and satellite operations will be difficult.

Inmarsat's filing. Inmarsat submitted an *ex parte* filing on May 21, 2002 that focuses on the extent of co-channel sharing that is possible between MSV's satellite and ancillary terrestrial operations.[3] Inmarsat purports to show that such sharing would be much less than MSV had claimed and that, as a result, MSV would need much more spectrum for its operations.

In fact, the 10 dB antenna isolation that MSV has used to define the geographic regions where the frequencies can be reused by the terrestrial component represents the average antenna discrimination over the plurality of terrestrial operations within a given area. Inmarsat is wrong in claiming that this performance index is not achievable.

[3] *See* Letter from John P. Janka, Counsel for Inmarsat, to Ms. Marlene H. Dortch, FCC, IB Docket No. 01-185 (May 21, 2002).

MSV has developed an approach (patent pending) that assures the stated level of average antenna discrimination.[4] Similarly, Inmarsat is wrong in arguing that beam scan aberration effects will have a meaningful impact on MSV's ability to reuse spectrum between its satellite and terrestrial operations. The data provided by Inmarsat in its filing presents an exaggerated view of these effects, but even as exaggerated by Inmarsat, it is apparent that they are not meaningful.

In any event, it is MSV that takes any risk that its terrestrial operations will not be able to gain access to as much spectrum as anticipated, since—as MSV has repeatedly acknowledged—its access to spectrum is entirely dependent on its ability to coordinate spectrum for its satellite traffic and the facilities used by that traffic alone. MSV's system is a satellite system, the terrestrial component of which will truly be ancillary, using only whatever spectrum is available to the satellite system.

Telcordia's analysis. The Telcordia analysis, submitted in the Sprint/Cingular *ex parte* filing of May 13, 2002, also looks at intra-system sharing between satellite and terrestrial operations.[5] It concludes that such sharing is less spectrum efficient than reallocating satellite spectrum to terrestrial-only use.

[4] The approach entails monitoring of the satellite broadcast control channels at the ATC base stations. This intelligence allows the network operator to accurately determine the antenna discrimination of the satellite beams in the vicinity of the base station. The base station will be assigned only frequencies of satellite beams that are seen with sufficient suppression. The information also may be used to adjust the satellite antenna contours (via feedback commands) to maximize discrimination in the direction of the ATC.

[5] *See* Letter from Sprint Corporation and Cingular Wireless LLC to Mr. Donald Abelson, Mr. Thomas Sugrue, and Mr. Edmond Thomas, FCC, IB Docket No. 01-185 (May 13, 2002).

The Telcordia analysis can not be applied to MSV's system because the parameters and system model that it uses in its mathematical analysis do not in any way relate to MSV. Among other things, (i) the systems analyzed by Telcordia are non-geostationary, which makes intra-system sharing more difficult; (ii) the Telcordia analysis ignores the use of satellite antenna discrimination to promote reuse; (iii) the Telcordia analysis assumes that the system will use CDMA technology and postulates intra-cell sharing; and (iv) Telcordia assumes that terrestrial operations will necessarily reduce satellite capacity, instead of (as is the case for MSV's system) requiring the use of a modest amount of satellite link margin to accommodate the effect of the ATC (this aspect of the Telcordia analysis may arguably be appropriate for a system whose satellite operations are based on CDMA technology, but it is not appropriate for a TDMA-based satellite operation that has 10 dB of return link margin).

IV. Monitoring of Terrestrial Emissions in the Uplink Band

MSV has noted that, as a further assurance that its terrestrial operations will not cause interference to Inmarsat's satellite uplinks, MSV will be able to use its own satellites to monitor its terrestrial emissions and present data from that monitoring to confirm that they are benign or, if necessary, reduce their operations. MSV has proposed to conduct the monitoring at its own satellites. Monitoring by MSV will always detect terrestrial emission levels before such emissions become noticeable by other systems. This is because MSV's own satellite antenna discrimination toward the terrestrial operations is limited to only 10 dB on average, whereas any other system that operates on the same frequencies will have at least 20 dB of satellite antenna discrimination.

Moreover, the elevation angle of any co-channel system generally will be lower than that of MSV's satellites, thus further reducing emissions in their direction.

Inmarsat, in an *ex parte* filing it submitted May 15, 2002, challenges the feasibility of that monitoring, claiming that (i) the terrestrial emissions will be too small to measure, particularly in the presence of MSV's own satellite signals; (ii) the measurement will be inaccurate because of the different gain profiles of the beams used for monitoring compared to the beams receiving the actual interference; and (iii) MSV's orbit location is too far from those of Inmarsat to provide reliable information.[6] As discussed below, those concerns are misplaced.

Terrestrial emissions are measurable. The claim that terrestrial emissions will be too small to measure is ironic, since it supports MSV's own analysis that the emissions will indeed be small. Nonetheless, however, they are measurable. MSV has developed several techniques (for which patent applications have been filed) for monitoring even these small signals. One technique relies on the fact that each satellite cell uses the resources allocated to it for satellite communications only once over its entire service footprint. Accordingly, during periods of silence, when a relevant satellite cell resource is not carrying traffic, measurements are made over that resource either at the gateway or at the satellite. Because such measurements are intentionally made during time intervals of satellite communications silence, they can only reflect the aggregate effect of receiver noise and interference. Thus, MSV's satellite transmissions do not interfere with measurements required to perform periodic monitoring of the aggregate ATC emissions level that is reaching the geo-stationary arc.

[6] *See* Letter from John P. Janka, Counsel for Inmarsat, to Ms. Marlene H. Dortch, FCC, IB Docket No. 01-185 (May 15, 2002).

Variations in satellite antenna gain will be taken into account. In the illustrations MSV has used to demonstrate how ATC will operate, it has used idealized circles to show how frequencies will be allocated in different geographic areas and has indicated that the average satellite antenna discrimination over the areas where frequencies will be reused terrestrially is 10 dB. MSV recognizes, however, that in actual operation, it will be necessary to account for variations in the satellite antenna gain. Since MSV knows the location of its terrestrial facilities, this will be a relatively simple matter. Moreover, in those cases where there may be significant terrestrial operations in areas where the satellite antenna discrimination for a given set of frequencies is less than 10 dB, MSV has the discretion to assign to those terrestrial facilities other frequencies that are used in more distant satellite spot beams. Also, as previously noted (see footnote 4) the network operator will be able to use the ATC base station to monitor the antenna discrimination of nearby satellite cells (via monitoring of the associated broadcast control channels) and via commands to the satellite digital beam forming network, modify the satellite cell contours to improve discrimination in its locality.

There will be no more blocking in the direction of MSV's satellites than in the direction of Inmarsat's satellites. Inmarsat also repeats its argument that MSV's satellites will not be located sufficiently close to Inmarsat's satellites to provide reliable monitoring, attaching maps of Boston, New Orleans, and Honolulu that it claims prove this point. Putting aside the fact that Inmarsat has made no attempt to prove that these three cities are representative of all cities where terrestrial facilities would operate, all the maps show is that there is significant randomness in the orientation of roads in these

cities. The maps certainly do not show that mobile terminals operating in these cities will experience less blocking towards Inmarsat's satellites than towards MSV's satellites.

Technical Certification

I, Dr. Peter D. Karabinis, Vice President and Chief Technical Officer of Mobile Satellite Ventures L.P., certify under penalty of perjury that:

I am the technically qualified person with overall responsibility for the preparation of the technical information contained in the above "Further Technical Analysis." The information contained in this document is true and correct to the best of my belief.

Dr. Peter D. Karabinis

Dated: July 29, 2002